

WHAT IS CLAIMED IS:

1. A single use syringe assembly comprising:

a barrel including a cylindrical side wall having an inside surface defining a chamber for retaining fluid, an open proximal end and a distal end including a distal wall with an elongate tip extending distally therefrom having a passageway therethrough in fluid communication with said chamber;

a needle cannula having a proximal end, a distal end and a lumen therethrough, said proximal end of said cannula being connected to said elongate tip so that said lumen is in fluid communication with said passageway;

an elongate needle shield hingedly connected to said barrel, said needle shield having two side walls defining a longitudinal opening and a back wall between said side walls defining a recess having an interior surface, said needle shield capable of pivoting from an open position wherein said needle cannula is exposed, to a closed needle protecting position wherein said distal end of said needle cannula is within said longitudinal opening of said shield;

a plunger including an elongate body portion having a proximal portion, a distal portion and a stopper slidably positioned in fluid-tight engagement with said inside surface of said barrel for drawing fluid into and driving fluid out of said chamber by movement of said stopper relative to said barrel, said elongate body portion extending outwardly from said open proximal end of said barrel; and

means for locking said plunger in said barrel when applying an additional distally directed force to said plunger after fluid has been delivered from said chamber.

2. The syringe assembly of claim 1 further including plunger weakening means for allowing said plunger to break upon application of excessive force intended to move said plunger proximally after said plunger has been locked to said barrel.

3. The syringe assembly of claim 1 wherein said means for locking includes a contractible portion on said plunger, a discontinuity on said plunger, a discontinuity on said barrel, said plunger discontinuity capable of engaging said barrel discontinuity when an additional distally directed force is applied to said plunger shortens said contractible portion so that said plunger discontinuity moves distally to engage said barrel discontinuity to lock said plunger in said barrel.

4. The syringe assembly of claim 3 wherein said contractible portion of said plunger comprises one or more flexible elements traversing a gap in said elongate body portion, said one or more elements capable of withstanding the forces of fluid delivery and deflectable upon application of said additional force.

5. The syringe assembly of claim 3 wherein said contractible portion on said plunger includes a cavity formed by a distal end of said plunger and an interior surface of said stopper, said plunger moving into said cavity upon application of said additional force.

6. The syringe assembly of claim 3 wherein said discontinuity on said barrel includes an inwardly directed projection on said inside surface of said barrel.

7. The syringe assembly of claim 6 wherein said inwardly directed projection is an annular ring.

8. The syringe assembly of claim 3 wherein said discontinuity on said plunger is an outwardly directed projection.

9. The syringe assembly of claim 8 wherein said outwardly directed projection is an annular ring.

10. The syringe assembly of claim 1 further including means for locking said needle shield in said closed needle protecting position when said needle shield is pivoted into said closed position.

11. The syringe assembly of claim 10 wherein said locking means includes an arm projecting from said interior surface of said needle shield, said arm having a free end positioned so that when said needle shield is pivoted to said closed position, said needle cannula moves past said free end and is trapped in said needle shield by said arm.

12. The syringe assembly of claim 10 wherein said locking means includes locking members on a proximal end of said needle shield engaging cooperating ledge at said distal end of said barrel when said needle shield is pivoted to said closed position.

13. The syringe assembly of claim 2 wherein said weakening means includes an area of reduced cross-sectional thickness in said proximal portion of said elongate body portion of said plunger.

14. The syringe assembly of claim 1 further comprising a needle assembly including said cannula and a hub having an open proximal end containing a cavity and a distal end attached to said proximal end of said cannula so that said lumen is in fluid communication with said cavity, said needle assembly being removably attached to said tip of said barrel through engagement of said tip to said cavity so that said lumen is in fluid communication with said chamber.

15. The syringe assembly of claim 1 wherein said stopper is made of material selected from the list consisting of thermoplastic elastomers, natural rubber, synthetic rubber, thermoplastic materials and combinations thereof.

16. A single use syringe assembly comprising:

a barrel including a cylindrical sidewall having an inside surface defining a chamber for retaining fluid, an open proximal end and a distal end including a distal wall with an elongate tip extending distally therefrom having a passageway therethrough in fluid communication with said chamber;

a needle assembly including a needle cannula having a proximal end, a distal end and a lumen therethrough and a hub, said hub having an open proximal end containing a cavity and a distal end attached to said proximal end of said cannula so that said lumen is in fluid communication with said cavity, said needle assembly being removably attached to said tip of said barrel through engagement of said tip to said cavity so that said lumen is in fluid communication with said chamber;

an elongate needle shield hingedly connected to said barrel, said needle shield having two sidewalls defining a longitudinal opening and a back wall between said sidewalls defining a recess having an interior surface, said needle shield capable of pivoting from an open position wherein said needle cannula is exposed, to a closed needle

protecting position wherein said distal end of said needle cannula is within said longitudinal opening of said shield;

a plunger including an elongate body portion having a proximal portion, a distal portion and a stopper slidably positioned in fluid-tight engagement with said inside surface of said barrel for drawing fluid into and driving fluid out of said chamber by movement of said stopper relative to said barrel, said elongate body portion extending outwardly from said open proximal end of said barrel; and

means for locking said plunger in said barrel when applying an additional distally directed force to said plunger after fluid has been delivered from said chamber, said means for locking including a contractible portion on said plunger, a discontinuity on said plunger, a discontinuity on said barrel, said plunger discontinuity capable of engaging said barrel discontinuity when an additional distally directed force is applied to said plunger shortens said contractible portion so that said plunger discontinuity moves distally to engage said barrel discontinuity to lock said plunger in said barrel, said contractible portion of said plunger comprising one or more flexible elements traversing a gap in said elongate body portion, said one or more elements capable of withstanding the forces of fluid delivery and deflectable upon application of said additional force.

17. The syringe assembly of claim 16 further including plunger weakening means for allowing said plunger to break upon application of excessive force intended to move said plunger proximally after said plunger has been locked to said barrel.

18. A single use syringe assembly comprising:

a barrel including a cylindrical sidewall having an inside surface defining a chamber for retaining fluid, an open proximal end and a distal end including a distal wall with an elongate tip extending distally therefrom having a passageway therethrough in fluid communication with said chamber;

a needle cannula having a proximal end, a distal end and a lumen therethrough, said proximal end of said cannula being connected to said elongate tip so that said lumen is in fluid communication with said passageway;

an elongate needle shield hingedly connected to said barrel, said needle shield having two sidewalls defining a longitudinal opening and a back wall between said side walls defining a recess having an interior surface, said needle shield capable of pivoting from an open position wherein said needle cannula is exposed, to a closed needle

protecting position wherein said distal end of said needle cannula is within said longitudinal opening of said shield;

a plunger including an elongate body portion having a proximal portion, a distal portion and a stopper slidably positioned in fluid-tight engagement with said inside surface of said barrel for drawing fluid into and driving fluid out of said chamber by movement of said stopper relative to said barrel, said elongate body portion extending outwardly from said open proximal end of said barrel; and

means for locking said plunger in said barrel when applying an additional distally directed force to said plunger after fluid has been delivered from said chamber, said means for locking including a contractible portion on said plunger, a discontinuity on said plunger, a discontinuity on said barrel, said plunger discontinuity capable of engaging said barrel discontinuity when an additional distally directed force is applied to said plunger shorts said contractible portion so that said plunger discontinuity moves distally to engage said barrel discontinuity to lock said plunger in said barrel.

19. The syringe assembly of claim 18 further including plunger weakening means for allowing said plunger to break upon application of excessive force intended to move said plunger proximally after said plunger has been locked to said barrel.

20. The syringe assembly of claim 18 wherein said contractible portion of said plunger comprises one or more flexible elements traversing a gap in said elongate body portion, said one or more elements capable of withstanding the forces of fluid delivery and deflectable upon application of said additional force.

21. The syringe assembly of claim 18 wherein said contractible portion on said plunger includes a cavity formed by a distal end of said plunger and an interior surface of said stopper, said plunger moving into said cavity upon application of said additional force.

22. The syringe assembly of claim 18 further including means for locking said needle shield in said closed needle protecting position when said needle shield is pivoted into said closed position.

23. The syringe assembly of claim 22 wherein said locking means includes an arm projecting from said interior surface of said needle shield, said arm having a free end positioned so that when said needle shield is pivoted to said closed position, said needle cannula moves past said free end and is trapped in said needle shield by said arm.

24. The syringe assembly of claim 22 wherein said locking means includes locking member on a proximal end of said needle shield engaging cooperating ledge at said distal end of said barrel when said needle shield is pivoted to said closed position.

25. The syringe assembly of claim 18 further comprising a needle assembly including said cannula and a hub having an open proximal end containing a cavity and a distal end attached to said proximal end of said cannula so that said lumen is in fluid communication with said cavity, said needle assembly being removably attached to said tip of said barrel through engagement of said tip to said cavity so that said lumen is in fluid communication with said chamber.